

3.0 Characteristic and Rare Species Associated with Great Lakes Alvars

3.1 Characteristic and Rare Plants

3.1.1 Rare Vascular Plants

The inventory of rare vascular plants in Great Lakes alvars was intended to document the occurrence and distribution of rare species, collect data to enable comparison and ranking of individual rare plant occurrences, and collect information needed to guide conservation design. While information on the distribution of characteristic alvar plants and the extent of confinement of vascular plants to alvar habitats was available for southern Ontario (Catling 1995), the status of rare alvar species across the Great Lakes basin was poorly known.

In 1995, the Alvar Working Group decided that the focus of rare plant data collection should be species of shared priority. This included the following:

- all G1 through G3 taxa,
- taxa that are ranked S1 through S2 in Michigan, New York, Ohio, and Ontario,
- rare taxa that are restricted primarily to alvar habitats in the Great Lakes basin, and
- any potential new "finds".

Collaborators compared state and provincial rare species tracking lists and identified a group of 11 species that were either globally or regionally rare and that were systematically sought and documented during alvar field surveys in all jurisdictions. An additional 13 state or provincially rare species were documented in jurisdictions where they were being tracked by the state or provincial Natural Heritage Program.

The initial list of 11 target rare plant species included the following species: wild chives (*Allium schoenoprasum* var. *sibiricum*), Cooper's milk vetch (*Astragalus neglectus*), sideoats grama (*Bouteloua curtipendula*), juniper sedge (*Carex juniperorum*), Hill's thistle (*Cirsium hillii*), Pitcher's thistle (*Cirsium pitcheri*), ram's-head ladyslipper (*Cypripedium arietinum*), lakeside daisy (*Hymenoxys herbacea*), dwarf lake iris (*Iris lacustris*), Houghton's goldenrod (*Solidago houghtonii*), and northern dropseed (*Sporobolus heterolepis*).

Conserving Great Lakes Alvars

The primary inventory method used was simply to search alvar sites for target species, often in conjunction with community field surveys. Target plants observed at alvar sites were documented by completing rare plant survey forms, which included data on geographic extent, population size, threats, disturbances, and basic habitat features.

As surveys were conducted, the list of target rare plants evolved. During 1995 field surveys in Ontario, a provincially rare chickweed (*Cerastium brachypodum*) was found at three alvar sites in the Napanee Plains. This species was added to the list of target rare plants, with the thought that it might be characteristic of alvar sites in the region. After field surveys were completed and inventory results compiled, it became apparent that not all of the target rare plant species are actually characteristic of alvar sites in the Great Lakes region. Although each of the initially targeted rare plants does occur in alvar habitats, some occur primarily in habitats that are not alvars, others are not globally rare, and the taxonomy of one (*Allium schoenoprasum* var. *sibiricum*) is questionable.

Therefore, the list of rare vascular plants characteristic of alvar habitats has been refined to include only globally rare species (ranked G1 through G3) that primarily occur in alvar habitats, or globally rare species that have large populations in at least three alvar sites. The resulting group of six rare vascular plants characteristic of Great Lakes alvars is presented in Table 3. The results of our field surveys for these species are briefly summarized below.

Table 3: Characteristic Rare Plants of Great Lakes Alvars

Scientific Name	Common Name	Global Rank
<i>Carex juniperorum</i>	Juniper sedge	G2
<i>Hymenoxys herbacea</i>	Lakeside daisy	G2
<i>Cirsium hillii</i>	Hill's thistle	G3
<i>Cypripedium arietinum</i>	Ram's-head lady's slipper	G3
<i>Iris lacustris</i>	Dwarf lake iris	G3
<i>Solidago houghtonii</i>	Houghton's goldenrod	G3

Juniper sedge (*Carex juniperorum*), G2

Juniper sedge is a small, grass-like plant in the sedge family that was recently described from a population found in an alvar site in the Napanee Plain in Ontario (Catling et al. 1993). It is found in red cedar / early buttercup alvar woodlands. Only one alvar site was documented with juniper sedge: Salmon River Alvar in Ontario.

Conserving Great Lakes Alvars

Lakeside daisy (*Hymenoxys herbacea*), G2

This showy, yellow composite has multiple common names. In Ohio and Illinois it is known as lakeside daisy, on the Bruce Peninsula it is called rubberweed, and it is locally known as Manitoulin gold on Manitoulin Island. This is an imperiled species that is endemic to alvar pavements, dolomite prairies, and grassy openings in cedar woodlands near the Great Lakes. Thirteen sites with lakeside daisy were documented in Ontario and Ohio. Lakeside daisy is primarily restricted to alvar sites in the Great Lakes region, although it does occur in a few other similar habitats (e.g., on moist calcareous tuffa in a white cedar woodland in northern Michigan).

Two sites on Kelley's Island in Ohio are abandoned quarries where the population was first established by transplanting plants that had been "rescued" from certain destruction in a quarry site on the Marblehead Peninsula. Seeds collected from Marblehead sites were also spread at the Kelley's Island sites, and the lakeside daisy population there is now reproducing and spreading. Because there are no historical records of lakeside daisy from Kelley's Island, those populations are not exactly a restoration; however, they are viable populations.

The 11 documented natural occurrences of lakeside daisy are at the following alvar sites: Marblehead Quarry/Lakeside Plains in Ohio, and in Ontario at Belanger Bay, Cabot Head, Dyer's Bay Road/Brinkman's Corners, East Side of Quarry Bay, Misery Bay, Taskerville, West of Lynn Point, Christina Bay/ Burnt Island Harbour, George Lake, and Silverwater Radio Towers. However, this species also is known to occur at other sites along the south shore of Manitoulin Island.

Hill's thistle (*Cirsium hillii*), G3

Hill's thistle is a showy thistle in the aster family with large, bright rose-purple flower heads. It is a biennial species (living two years, flowering in the second year). This rare species in the Great Lakes region occurs on sand plains, juniper alvar shrublands, and poverty grass alvar grasslands with sandy soils. Twenty-one sites with Hill's thistle were documented, mostly in the Bruce Peninsula, Manitoulin Island, and Drummond Island.

The Ontario alvar sites with Hill's thistle are LaCloche Area, Barney Lake, Chief's Point, East Side of Quarry Bay, Evansville

Conserving Great Lakes Alvars

Shrubland, Misery Bay, Taskerville, West of Lynn Point, Christina Bay/Burnt Island Harbour, Driftwood Cove, Pike Bay, Scugog Lake, Sideroad Creek, West of South Baymouth, and Belanger Bay. In Michigan, alvar sites with this species are Bass Cove, Huron Bay Road, Jones Lake-Drummond Island, Maxton Plains, Seaman's Point, and The Rock.

Ram's-head lady's slipper (*Cypripedium arietinum*), G3

Ram's-head lady's slipper is a small orchid with a petite, colorful flower. It is rare in the Great Lakes region and occurs in coniferous alvar woodlands. The Alvar Initiative documented nine alvar sites with ram's-head lady's slipper: Burnt Rock Barrens, Chaumont Barrens, and Limerick Cedars in New York state; Burnt Lands, LaCloche Area, and Belanger Bay alvars in Ontario; and Big Shoal Cove, Huron Bay, and Thunder Bay Island in Michigan.

Dwarf lake iris (*Iris lacustris*), G3

Dwarf lake iris is a diminutive plant that is usually less than 18 cm tall, with showy blue flowers. It is endemic to the Great Lakes, near the shores of Lake Huron, Lake Michigan, and Lake Superior. It is abundant in the ground layer of the scrub conifer / dwarf lake iris alvar shrubland community and is commonly found on the Great Lakes limestone bedrock shore. The species also occurs in openings in white cedar woodlands.

Dwarf lake iris was documented at 20 alvar sites in Ontario, Michigan, and Wisconsin: Baptist Harbour, Chief's Point, Dyer's Bay/Brinkman's Corners, Scugog Lake, West of South Baymouth, Pike Bay, Belanger Bay, and Pine Tree Harbour in Ontario; Charboneau Lake, Escanaba River South, Garden Southeast Glade, Goudreau's Harbour, Grand Lake, Kregg Bay Glade, Kregg Bay NE, Point Detour, Poverty Island-East Shore, Sucker Lake, and Thompson's Harbor in Michigan; and at the State Highway 57 expansion project in Wisconsin.

Houghton's goldenrod (*Solidago houghtonii*), G3

Houghton's goldenrod is a slender yellow composite. It is a rare species endemic to the Great Lakes region, usually occurring in wetlands, moist beaches, and moist swales behind dunes; it is also occasionally found in little bluestem alvar grasslands. Houghton's goldenrod was found in five alvar sites: Tamarack Harbour,

Conserving Great Lakes Alvars

Strawberry Island, LaCloche Area, and Cabot Head in Ontario; and Seaman's Point in Michigan.

3.1.2 Characteristic Nonvascular Plants: Lichens, Mosses, Algae

The Alvar Working Group recognized that alvars have a diverse array of lichens, mosses, and other nonvascular plants, and that some of these nonvascular species are rare. Little work had been done previously to document nonvascular plants in North American alvars; most of the known information was from intensive studies at a few sites (Gilman 1995; Schaefer 1996). Objectives for the inventory of nonvascular plants were mainly to assist the community classification process, to increase understanding of ecological diversity in alvars, and to identify globally and regionally significant species, building a picture of their rarity and their distribution in alvars.

Nonvascular plants were collected as part of alvar community field surveys if the surveyor estimated they had at least 5% cover in a community type. This was intended to obtain a representative sample of the diversity of nonvascular plants in alvars. In addition, a few sites were visited by experts in taxonomy of nonvascular plants, with a goal of finding rare species and compiling more complete species lists. Many collections of mosses, lichens, liverworts, and a few algae were made during Alvar Initiative surveys, but only a small portion of these have been identified. Mosses collected in Ontario are currently being identified, but most lichens collected in Ontario, and some of the lichens and mosses collected from New York and Michigan, are awaiting evaluation by experts.

The most abundant nonvascular plants of alvar communities are noted in the alvar community descriptions in Section 2.2 of this report, and briefly summarized here. Mosses such as *Bryum pseudotriquetrum* and *Drepanocladus* spp. often form a dense mat underneath the grasses in wet microhabitats of tufted hairgrass wet alvar grassland. Crustose lichens such as *Placynthium nigrum*, and the foliose lichen *Dermatocarpon miniatum* are common on limestone and dolostone surfaces in alvar nonvascular pavements. The lichens commonly known as reindeer moss (*Cladonia* spp.), Iceland moss (*Cetraria arenaria*), and cup lichens (*Cladonia* spp.) are common in dry alvar habitats, such as juniper alvar shrublands. A very common alga in ephemeral pools in alvar grasslands is *Nostoc commune*; it looks like gelatinous blobs when wet and dries to a papery thin mat.

Several rare mosses and lichens have been identified from alvar habitats. A rare moss, *Pseudocalliergon turgescens* (also known as *Scorpidium turgescens*, ranked G3G5), is characteristic of moist depressions in tufted hairgrass wet alvar grasslands

Conserving Great Lakes Alvars

(Slack et al. 1988) and in little bluestem alvar grasslands. Other rare mosses that have been reported include *Limprichtia cossonii* (also known as *Drepanocladus revolvens* var. *intermedius*, ranked G?), *Tortella inclinata* (G4G5), *Tortula muralis* (G5), and *Tortula cainii* (G1?). The latter species is apparently restricted to karst habitats in alvar regions (Zander and Eckel 1980) and may be an alvar endemic (this is not yet confirmed); it was reported from localities in the Bruce Peninsula and Carden Plain.

Rare lichens that have been identified from alvar sites include *Placynthium petersii* (G?) and *Psora decipiens* (G?). Collections of lichens in the genus *Dermatocarpon* from Chaumont Barrens in New York have been tentatively identified as a new species that may be endemic to alvars (R. Harris, personal comment), but this is not yet confirmed.

Certain microscopic algae, in particular the alga *Gloeocapsa alpina*, were found to be abundant on dolomites in the Bruce Peninsula (Schaefer 1996) and may be common in many alvar sites. These tiny algae grow within the surface of the exposed rock, giving the naturally pale-colored rock a dark gray color when dry and nearly black when wet. Most people looking at these rocks would not guess they had any plants on them at all, but a specialist in algae would recognize these surface algae as one of the most common organisms in the alvar nonvascular pavement community.

Diverse communities of algae and bacteria are found in some wet depressions on alvar pavements; sometimes they form a slimy pink or white mat in shallow depressions. At least some of these organisms are "nitrogen-fixers" which have the ability to convert atmospheric nitrogen into organic compounds that make the nitrogen available to other plants. Therefore, these microbial communities may have a very important ecological role in alvars. These communities of little-known microscopic organisms may be very rare and certainly warrant further study. Schaefer (1996) noted that some of the microbial crust communities are very fragile and can be easily disturbed by trampling.

Detailed descriptions of the nonvascular flora have been recently completed for several alvar sites, including a study of Maxton Plains in Michigan (Marr 1997), seven sites on the Bruce Peninsula (Schaefer 1996), and Limerick Cedars in New York state (Gilman 1995).

Conserving Great Lakes Alvars

3.2 Characteristic Invertebrates, Birds, and Rare Animals

Given the unusual assemblage of plants associated with Great Lakes alvars, it could be expected that alvar animal life should also contain many rarities or unusual faunal assemblages. Based on information collected over the past four years, that expectation is well fulfilled, particularly among the invertebrate species which tend to colonize slowly. Many alvar invertebrate species are thought to be isolated remnants of a prairie-like community that covered a wide area of central North America during the Hypsithermal period of warmer and drier climate some 4,000 to 8,000 years ago.

These disjunct species act as important clues to the origins of ecological communities and are of great scientific value. For example, the Burnt Lands alvar has a thriving population of a wingless prairie leafhopper whose nearest other known population is on the Bruce Peninsula. Many species of terrestrial snails found on Great Lakes alvars are also disjunct populations, sometimes separated from their main range by thousands of kilometers. These isolated populations of species which disperse very slowly provide a vital glimpse into the ecological history of alvar sites as well as a scientific resource to study the processes by which new species emerge.

3.2.1 Inventory Methods for Invertebrate Surveys

Collaborators agreed to focus invertebrate surveys on a few select groups that were likely to have rare species in alvar habitats. These groups were selected because they are sufficiently well-known taxonomically, and they are groups with taxonomic expertise readily available to collaborators. The main groups of invertebrates surveyed were terrestrial molluscs, or land snails (Gastropods), and four groups of insects: sawflies (Hymenoptera), tiger beetles and ground beetles (Coleoptera), leafhoppers (Homoptera), and butterflies and noctuid moths (Lepidoptera).

The primary inventory technique for land snails was to search appropriate microhabitats in alvar sites, such as under rocks or in humus at the bottom of deep crevices or grikes. When land snails were found, surveyors collected live specimens and delivered them to F. Wayne Grimm, a Canadian expert in terrestrial molluscs, for taxonomic work. Mr. Grimm also surveyed a large number of alvar sites in person.

Insects were sampled in a variety of representative alvar habitats. For example, in New York state, three alvar sites with grassland and pavement habitats were

Conserving Great Lakes Alvars

selected. Sampling techniques included use of nocturnal blacklight traps for moths, and both netting and baiting by daylight. In Michigan and Ontario, collecting techniques also included use of malaise traps and pitfall traps. Details of the inventory methods varied among jurisdictions and are presented in the reports listed in Chapter 6.

The most comprehensive surveys of insect biodiversity in alvars were carried out by Patrice Bouchard, then of McGill University, who sampled alvar pavements, grasslands, and shrublands on Manitoulin Island, the Bruce Peninsula, Carden Plain, Napanee Plain, and Smiths Falls Plain. He collected over 25,000 specimens from five target insect groups, including over 600 species. His work is described in detail in his report *Insect Diversity in Alvars of Southern Ontario*, submitted to the Federation of Ontario Naturalists in 1998 (Bouchard 1998). Other insect collecting as part of the Alvar Initiative was carried out by Ed Stanton on New York alvars (Stanton 1997), Dave Cuthrell on Michigan sites, and Andy Hamilton on sites across the Great Lakes basin. A number of other researchers have independently sampled alvar sites.

3.2.2 Insects

The current state of knowledge of alvar fauna is much less complete than for its floral characteristics, given the number of species involved and the ability to sample only a few sites. Based on the few groups of insect species that were studied in more depth, for example, about 30% of Ontario's insects could be expected to occur on alvars – about 12,000 species in all. Among the 600 species studied, roughly 5% to 8% are special to some degree in alvars. If the same proportion holds true for other insect groups, about 600 to 1,000 insect species would be peculiar to alvars – a significant number in terms of conserving biodiversity [Henri Goulet, personal communication].

This important contribution of insect life to the species diversity of alvar habitats has also been noted from European studies. Rosen (1995) observed that alvars (and especially dry grassland alvars) are thought to be among the most species-rich communities in the world on the small scale (10 to 100 cm²) and are of extraordinary protection value. However, the greatest possible diversity should not be the only criteria used in selecting sites for conservation (See Chapter 5). Bouchard's work appears to agree with studies of Swedish alvars which show that insect diversity is highest in alvars with rich vegetation, but the most rare arthropod species are often found in sites with poor, low-growing vegetation (Coulianos and Sylven 1983). In addition, finding evidence of sustainable populations on a site is important, such as sites with dominant populations of significant species or sites where reproduction can be confirmed.

Conserving Great Lakes Alvars

Among the 600 species of insects collected from alvars, Bouchard identifies 54 as biologically significant, which include the following:

- species rarely collected outside alvars but common within them;
- species rarely collected but found in small numbers within alvars;
- species at or near the limit of their geographical range in alvars;
- species new to science; and
- species found nowhere else within the Great Lakes region but on alvars.

Ground beetles and tiger beetles

Ground beetles are commonly found in alvar habitats, with the largest numbers in some grassland alvars, and a high species diversity (but low numbers) on pavement alvars. Shrubland alvars seem less diverse for ground beetle species than other community types. Among the 143 species of ground beetles recorded in southern Ontario alvars in 1996 and 1997, four species are listed by Bouchard as very rarely collected in Ontario but occurring in dominant numbers in one or more alvar sites:

Agonum nutans occurred in all grassland alvars surveyed; prairie remnant associations.

Chlaenius p. purpuricollis was found in grassland alvars on Manitoulin, Burnt Lands, Carden, Camden East, and Maxton Plains; likely restricted to alvar habitats in the Great Lakes basin.

Pterostichus novus was present at all alvars surveyed by Bouchard as well as at alvars in Quebec and Maxton Plains. However, this species is also common on most non-wetland habitats on the upper Bruce Peninsula (Steve Marshall, pers. comm.).

Amara pennsylvanica was found at Burnt Lands and Camden East grassland alvars.

Several other species are very rarely collected outside alvars and are found either in small numbers in alvars (*Carabus sylvosus*) or in larger numbers (*Cicindela denikei*, *Cyclotrachelus sodalis*, *Harpalus faunus*, *H. fallax*), or are at the extreme limit of their range in Ontario alvars (e.g. *Pterostichus permundus*, *Cymindis americana*, *Carabus sylvosus*).

Leafhoppers

Information on leafhoppers and their relatives was collected by Bouchard at 10 Ontario sites, but was supplemented with data on Michigan alvars

Conserving Great Lakes Alvars

provided by D. Cuthrell and from the extensive collections across the Great Lakes basin by K.G.A. Hamilton (Hamilton 1990, 1994, 1995). Alvar sites with dense vegetation such as alvar grassland and savanna grasslands in general support larger numbers of leafhoppers than pavement or shrubland alvars. Among the over 230 species reported in Great Lakes alvars, 17 species are thought to be North American prairie endemics, which are very restricted in distribution in this region:

Aflexia rubranura, found on Manitoulin grassland and pavement alvars only, disjunct from Manitoba to Illinois range.

Auridius sp. n., found on Manitoulin, Bruce Peninsula, Maxton Plains, and Bass Cove, otherwise known only from Alberta and Wisconsin.

Flexamia delongi, on Manitoulin, Bruce Peninsula, Maxton Plains, Huron Bay, and Warner's Cove.

Flexamia inflata, on Camden East and other Napanee Plain alvars.

Graminella mohri, on Bruce Peninsula alvars, disjunct from Texas to Illinois range.

Limotettix urnura, on Manitoulin Island, Bruce Peninsula, Maxton Plains, and Marblehead.

Memnonia sp. n., on Manitoulin Island, Bruce Peninsula, Carden, Burnt Lands, disjunct from Manitoba to Illinois range.

Mocuellus americanus, on Manitoulin alvars.

Paraphlepsius lobatus, on Manitoulin and Bruce Peninsula alvars.

Pendarus punctiscriptus, on Manitoulin, Bruce Peninsula, and northern Michigan alvars.

Texananus marmor, on Manitoulin and Bruce Peninsula alvars, disjunct from Montana to Manitoba range.

Delphacodes nigriscutellata (a planthopper species), on Burnt Lands, Bruce Peninsula, and Manitoulin alvars, disjunct from Kansas to Wisconsin range.

Chlorotettix spatulatus, on the Marblehead alvar.

Laevicephalus minimus, on the Marblehead alvar.

Polyamia caperata, on the Marblehead and Camden East alvars.

Aceratagallia sp. n., on Chaumont Barrens and Three Mile Creek Barrens.

Manitoulin Island and the Bruce Peninsula are especially rich in western leafhoppers, while alvars on the Door and Garden peninsulas in Lake

Conserving Great Lakes Alvars

Michigan appear to be particularly depauperate. Hamilton (1996) speculates that this could be the result of these Michigan sites having been completely overgrown by cedar in prehistoric times.

Four other leafhopper species are at the extreme limits of their ranges in Great Lakes alvars:

Idiocerus productus, an arctic-alpine species found on Carden Alvar #3 only (new Ontario record).

Clastoptera arborina, near its northern limit at Camden East alvar.

Chlorotettix fallax, at its northern limit at Marblehead (new Ohio record).

Graminella aureovittata, at its northern limit at Marblehead (new Ohio record).

Leafhoppers could be usefully studied as an important indicator group for the quality of alvar habitats, since they have a great diversity of species occurring on alvars, and a high number of species that are monophagous (i.e. feed only on one plant species) on alvar-restricted plants. For example, several host-specific leafhoppers feed on *Eleocharis elliptica*, a plant species that is common in such alvar sites as Cape Croker [A. Hamilton, pers. comm.].

Butterflies, skippers, and moths

Documentation of butterflies and skippers is widespread, with considerable work having been done in the Burnt Lands alvars (Brunton 1986), in New York state alvars (Stanton 1997), in the Carden alvars by Bob Bowles (unpublished list), and in Maxton Plains by Steve Stephenson (unpublished list). Bouchard recorded a total of 44 species.

Seven species are noted for their rarity at the provincial level or at a regional scale. The garita skipper (*Oarisma garita*), which occurs on the LaCloche alvar, is a disjunct from a population 1,000 km to the west. The Napanee Plain alvars have the majority of the Ontario population of olive hairstreak (*Mitoura gryneus*), a very localized butterfly in Ontario. Two other butterflies with restricted occurrence in Ontario are also associated with alvars – the hoary elfin (*Incizalia polios*) and the mottled duskywing (*Erynnis martialis*) (Catling and Brownell 1995). Brunton (1986) identified a new species of owlet moth (Noctuidae family) from the Burnt Lands alvar near Ottawa.

Conserving Great Lakes Alvars

Other butterfly species noted by Bouchard as significant include two species at their northern range limit – columbine dusky wing (*Erynnis lucilius*) and olympia marblewing (*Euchloe olympia*); three species at their southern limits – chryxus arctic (*Oneis chryxus*), Laurentian skipper (*Hesperia comma*), and large marblewing (*Euchloe ausonides*); and one other widespread but local species, tawny crescent (*Phyciodes batesii*).

Survey work by Ed Stanton on New York state alvars (Stanton, 1997) identified 324 species of Lepidoptera, including *Euchloe olympia* at Chaumont Barrens, two new state records (*Semiothisa denticulata* and *Othodes obscura*), and one species previously thought extirpated from the state (*Eacles imperialis imperialis*).

Sawflies

Sawflies are another insect group with interesting alvar affinities. Dr. H. Goulet found two species of prairie sawflies (*Blennogeneris spissipes* and *Zachizonyx montana*) on the Almonte (Burnt Lands) alvars near Ottawa and a nearby site in Quebec. Bouchard recorded 144 species of sawflies in Ontario alvars, including the following:

Pseudodineura rileda, a species new to Canada, on Carden shrubland alvar.

Rhadinoceraea sp.n., thought to be a new species to science, found on white camass plants (*Zigadenus elegans*) on the Bruce Peninsula (both on alvar and non-alvar habitats).

Several rarely collected species, including *Sterictiphora serotina*, *Periclista albicollis*, *P. diluta*, and *Tenthredo spp.*

Two species near their range limits – *Empria candidata* and *Eutomostethus luteiventris*.

Zachizonyx montana, a western disjunct, was also found on Carden shrubland alvar.

Orthopteroids

A total of 54 species of orthopteroid insects (which includes grasshoppers, crickets, mantids, walkingsticks, and cockroaches) is known from Ontario and northern Michigan alvars, particularly from grassland alvars. Eight of these species are rare in Ontario:

Conserving Great Lakes Alvars

Melanoplus mancus, collected only from Carden alvar #1.

Melanoplus p. punctulatus, found in two eastern Ontario alvars, though not primarily an alvar species.

Melanoplus huroni, collected only from Manitoulin Island shrubland alvar.

Orphulella p. pelidna, a dominant species on Burnt Lands alvar; also found in Camden East alvar.

Scudderia septentrionalis, from alvar savanna grassland on Manitoulin Island.

Ceuthophilis meridionalis, restricted to Great Lakes region, found in most alvars surveyed.

Conocephalus saltans, a prairie associate found in most grassland alvars surveyed.

Conocephalus strictus, collected only from Camden East grassland alvar.

One other rare grasshopper, *Stethophyma gracila*, has been found on Maxton Plains alvar.

Two other species found are listed as highly dependent on native prairie remnants: *Melanoplus dawsonii* found on Carden Plains and Manitoulin alvars (also occurs commonly on peatlands), and *Scudderia pistillata* at two alvar grassland sites on Manitoulin. One grasshopper species that is especially common on alvars, although not restricted to these habitats, is *Trimerotropis verruculata*.

3.2.3 Terrestrial Molluscs

Other faunal work sponsored by the International Alvar Conservation Initiative includes the surveying of over 100 alvar sites for terrestrial molluscs by F. Wayne Grimm. Grimm found 132 land snail species and 23 amphibious *Basommatophora* species on alvars, roughly two-thirds of all the species known from the Great Lakes basin. The origins of this faunal assemblage appear to be widespread, but with Carolinian east, Ohio-Mississippi basin, periglacial relict, and holarctic associations particularly well represented. Twenty-five of these taxa are strictly confined to alvars within the Great Lakes basin, but are known from tundra, cliffs, seeps, and rockslides elsewhere. A total of 26 proposed new species are in the process of being described, named, and illustrated as a result of Grimm's work.

Many of the small species of snails found on alvars are confined to very small sites within each alvar – single cracks, small rubble piles, or single rockflats.

Conserving Great Lakes Alvars

The observed extent of a given colony is likely to be less than 10 meters square, and colonies are often distributed sporadically in each alvar. Species and numbers of molluscs were most evident in well-drained cracks, under cover at the edges of rockflats, on open shores above the strandline, and at the edges of curtain forests.

Based on Grimm's work, it appears that the presence of rare, endemic, or disjunct taxa of terrestrial molluscs can be expected in large alvars (greater than 200 ha) that are relatively free of anthropogenic disturbance and grazing by livestock. In the sampled sites, rare molluscs were absent from only those alvars that exhibited grazing pressure or large quantities of exotic grasses. The Bruce Peninsula, Carden Plain, and Napanee Plain were identified as locations with particular potential for new finds of rare species from future inventory work.

For conservation purposes, it was also noted that fire eliminates the molluscan fauna of alvars unless refugia are retained in deep cracks or seeps. In the Burnt Lands alvar, for example, which burned approximately 100 years ago, the unique molluscan fauna is retained only in scattered zones free from evidence of burning. All of the small molluscs noted in previously burned habitats are commonplace species known to be tolerant of disturbance.

While a more comprehensive analysis of significant terrestrial snails on individual alvar sites awaits further confirmation and reporting on specimen collections, the following taxa should be included on a preliminary list of significant alvar species:

Vertigo hannai (G1 rank, S1 in Ontario): Burnt Lands alvar

Vertigo morsei (G1G2 rank, S2 in Ontario): Misery Bay, Scugog Lake, West of Lynn Point, Belanger Bay, Murphy Point, Lonely Point, Drummond Island, Michigan Upper Peninsula alvars

Vertigo elatior (G2G3 rank, S2S3 in Ontario): Burnt Lands, Point Anne, Scugog Lake, West of Lynn Point alvars

Vertigo paradoxa (G2G3 rank, S2S3 in Ontario): Stony Swamp, Dyer's Bay/Brinkman's Corners alvars

Vertigo ventricosa (G3 rank, S2 in Ontario): Salmon River, Burnt Lands, Pendall Lake, West of South Baymouth, Christina Bay/Burnt Island Neck, Murphy Point alvars

Vertico cristata (provisional G2G3 rank, S1 in Ontario): Stony Swamp, Evansville alvars

Conserving Great Lakes Alvars

Vertigo arthuri n. subsp. (provisional G1 rank, S1 in Ontario): Burnt Lands, Seymour Conservation Area

Vertigo basidens (provisional G2 rank, S1 in Ontario): Burnt Lands alvar

Vertigo hubrichti (G2 rank): Goudreau's Harbor

Catinella aprica (G3 rank, S2 in Ontario): Burnt Lands, Salmon River, Claybank, Scugog Lake, Evansville, Belanger Bay alvars

Catinella exile (G1G2 rank, S1 in Ontario): Garden Peninsula, Big Shoal Cove, Pendall Lake, West of South Baymouth, Lonely Point, East of Quarry Bay, Belanger Bay, Misery Bay, LaCloche Area alvars

Additional rare species can be anticipated as Wayne Grimm's work is compiled and reviewed and as new species are confirmed. A more detailed treatment of the relationships between terrestrial molluscs and alvars or other habitats is provided in *Terrestrial Molluscs of the Mixed Wood Plain Ecozone* (in Smith 1996), *Molluscs of the Alvar Arc and the Niagara Cuesta Uplands and Barren Zones* (Grimm 1995), and in the upcoming report to TNC Great Lakes Program *Rare pulmonate mollusca from alvars in the Great Lakes Basin* (Grimm, in preparation).

3.2.4 Birds, Herptiles, and Other Fauna

Larger forms of wildlife, which are more mobile and tend to disperse fairly readily, do not show the same degree of confinement to alvars as some insects and molluscs. Nonetheless, alvar habitats do have characteristic species of birds and other wildlife associated with them.

While no specific studies of bird life were carried out as part of the Alvar Initiative, it is clear that alvar habitats support a rich diversity of bird life. Forest-field edge species are common, and in alvar woodlands many of the typical forest species also occur. However, less common bird species also breed within alvar areas, including some that are notable for their rarity.

Extensive grassland alvars provide suitable breeding habitat for a guild of grassland birds which as a group are declining in population more rapidly than any other group of songbirds (Dunn and Downes 1998). Alvars appear to be especially important to species that require short-grass conditions for nesting, such as upland sandpiper (*Bartramia longicauda*) and grasshopper sparrow (*Ammodramus savannarum*). On Manitoulin Island, alvar grasslands also provide habitat for prairie sharp-tailed grouse (*Tympanuchus phasianellus campestris*). Alvars are also at the core of remaining habitats for nesting loggerhead shrike (*Lanius ludovicianus migrans*), which is ranked as a G4G5T3, but with populations declining precipitously in northeastern North America. Within the last several years,

Conserving Great Lakes Alvars

shrike nesting has been documented on Asselstine alvar, Cameron Ranch, and Carden alvar 5c.

Alvar shrublands also have a characteristic set of associated birds, such as rufous-sided towhee (*Pipilo erythrophthalmus*), indigo bunting (*Passerina cyanea*), brown thrasher (*Toxostoma rufum*), and clay-colored sparrow (*Spizella pallida*).

No herptile (reptile and amphibian) species are known to be wholly dependent on alvar habitats, but several significant species do occur on alvars. The eastern yellowbelly racer snake (*Coluber constrictor flaviventris*), an endangered species in Ontario, occurs on the Stone Road alvar as well as other undeveloped parts of Pelee Island. On the Bruce Peninsula, eastern massasauga rattlesnakes (*Sistrurus catenatus catenatus*), a nationally threatened species in Canada and a candidate for Federal listing in the U.S (ranked G3G4T3T4), occur frequently in alvar areas, including recent records in these locations:

Cape Croker alvar	Pike Bay alvar
Dyer's Bay/Brinkman's Corners alvar	Pine Tree Harbour alvar
George Lake alvar	Scugog Lake alvar
Pendall Lake alvar	Sideroad Creek alvar

Similarly, no mammal species are known to be dependent on alvars, although the database on small mammals is weak. White-tail deer (*Odocoileus virginianus*) are certainly abundant around most alvar areas, as demonstrated by their browsing pressure on shrubs and other vascular plants. In some areas such as the Carden alvars, the open habitats provided by alvar grasslands lose their snow earlier than the adjacent conifer deer yard areas, and late winter sightings of large herds of deer on the alvars have been reported (Bob Bowles, pers. comm.).